

551.506 (73) DETAILS OF THE WEATHER IN THE UNITED STATES

GENERAL CONDITIONS

The two outstanding features of the month were the extraordinary hot spell that culminated on the 21st-22d in northeastern districts and the West Indian hurricane that passed inland over Florida and the East Gulf States on the closing days of the month.

High temperatures in northeastern districts were the result of what appears to have been a purely fortuitous pressure distribution at the time. The ordinary succession of anticyclone and cyclone is anticyclone-cyclone-anticyclone, etc., etc. In this particular case the succession was different, viz, anticyclone-cyclone-cyclone-anticyclone.

The wind-systems associated with these barometric formations as they move eastward along the border between Canada and the United States, as is well known, induce successively an indraught of warm air from the south in cyclones and cool air from the north in anticyclones; when, however, as in July 1926, a cyclonic wind system is immediately followed by a second cyclonic system there can be but one result, viz, an intensification of the temperature, and this is precisely what happened on the days in question.

The anticyclone which dissipated the heat wave arrived over the North Atlantic so timed as to prevent the West Indian hurricane from recurving to the northeast when the latter was off the east Florida coast and it was therefore forced to pass inland and soon to lose its tropical characteristics.

The usual details of the weather of the month follow and these are further illumined by the series of Charts Nos. I-VI.—A. J. H.

CYCLONES AND ANTICYCLONES

By W. P. DAY

The tracks of 15 low-pressure and 8 high-pressure areas were charted for the month of July. The feature of the month, however, was the West Indian hurricane of the 22d to 31st, which has been treated elsewhere in this REVIEW. There were no other storms of more than slight intensity and the HIGHS were generally inactive.

FREE-AIR SUMMARY

By L. T. SAMUELS

The mean free-air temperatures for the month averaged close to their normal values, there being a rather marked tendency, however, for increasing positive departures to obtain at the upper levels at all aerological stations except Ellendale. The same was generally true for the vapor pressure, while the relative humidity departures were small and mostly of opposite sign to those for temperature. (Table 1.)

The most striking feature in Table 2 is the marked contrast between the resultant winds up to the 2,500 m. level at Ellendale and their normal directions for these levels. The unusually large number of days with deep easterly winds at this northern station made it impossible for the kites to attain their usual maximum altitudes.

It is of interest to note the prevalence of easterly winds reaching to the cirrus level and occasionally

higher over the southeastern part of the country from the 18th to 22d, during which time exceedingly high surface temperatures occurred throughout the region. During this period the Bermuda HIGH extended its influence over this area and pilot-balloon observations showed that the southerly winds in its rear sector did not veer with altitude and become westerly, but backed and shifted to easterly. One of the most interesting observations made during this period was the double theodolite observation on the 19th at Broken Arrow to a height of 14 km.; easterly winds of moderate velocity were found to prevail to this level.

What is believed to be a record altitude for a two-theodolite observation was made at Broken Arrow on the 3d. The balloon was followed with both theodolites for 122 minutes and a practically uniform rate of ascent (about 190 m. p. m.) continued during the first 100 minutes, at the end of which the height was 19 km. During the last 22 minutes, however, the rate of ascent decreased considerably (averaging only about 90 m. p. m.) and the greatest height reached was 21 km. Easterly winds of 12 m. p. s. prevailed at this altitude. The balloon was finally eclipsed by Ci. Cu. clouds. It was the very light winds, of course, which made it possible to follow the balloon for so long a time and to such a great height.

On the morning of the 29th Due West was situated in the northern sector of a tropical hurricane. Notwithstanding decidedly unfavorable conditions for a kite flight, owing to light rain, low clouds, and a rapid increase in wind velocity off the ground, a flight was started and 1,365 m. altitude above ground attained. The record revealed a deep cloud layer with its base only a few hundred meters above ground and extending higher than the maximum altitude reached by the kites. On the previous day (28th), i. e., before the tropical storm had reached Due West, the top of this cloud layer was found to be only 800 m. above ground. An examination of these records shows that while the free-air temperatures rose from the 28th to the 29th throughout an 800 m., air column, i. e., to the upper limit of the cloud layer on the 28th, above this level the temperatures were lower on the 29th than on the 28th. Of special interest is the fact that throughout this higher air column wherein condensation had occurred (as indicated by the increased thickness of the cloud layer by the 29th) an actual decrease in temperature from the previous day occurred despite the latent heat of condensation thus necessarily liberated. It is therefore rather strikingly shown that a pronounced lowering of the temperatures at elevations above 800 m. occurred with the arrival of the northern sector of this tropical disturbance. The observed temperatures on these days are shown in the following table:

Altitude (m.) m. s. l.	Temperature (° C.)		Altitude (m.) m. s. l.	Temperature (° C.)	
	28th	29th		28th	29th
217 (surface)	22.2	23.4	1,000	17.5	18.3
250	22.0	23.1	1,250	17.8	17.3
500	20.5	21.0	1,500	16.7	15.7
750	19.0	19.2	2,000	13.9	13.0

† Extrapolated.

TABLE 1.—Free-air temperatures, relative humidities, and vapor pressures during July, 1926

TEMPERATURE (° C.)											
Altitude, m. s. l. (meters)	Broken Arrow, Okla. (233 meters)		Due West, S. C. (217 meters)		Ellendale, N. Dak. (444 meters)		Groesbeck, Tex. (141 meters)		Royal Center, Ind. (225 meters)		*Washington, D. C. (7 meters)
	Mean	De- parture from 8-year mean	Mean	De- parture from 6-year mean	Mean	De- parture from 9-year mean	Mean	De- parture from 8-year mean	Mean	De- parture from 9-year mean	Mean
Surface-----	25.2	-1.5	27.8	+0.4	22.1	+0.8	26.4	-0.4	24.2	-0.8	23.2
250-----	25.0	-1.6	27.5	+0.5	21.6	+0.7	25.7	-0.2	23.9	-0.8	21.5
500-----	23.6	-1.4	25.2	+0.7	21.6	+0.7	24.1	+0.1	21.7	-0.5	20.5
750-----	22.2	-1.4	23.1	+0.5	20.2	+0.6	22.7	-0.1	20.7	+0.3	19.3
1,000-----	20.8	-1.4	21.5	+0.6	18.9	+0.5	21.3	-0.4	18.9	+0.3	18.1
1,250-----	19.5	-1.1	19.9	+0.8	17.6	+0.3	20.0	-0.5	17.2	+0.3	16.7
1,500-----	18.7	-0.4	18.3	+0.9	16.1	0.0	18.9	-0.2	16.0	+0.6	15.4
2,000-----	16.7	+0.7	14.7	+0.6	13.2	-0.2	16.4	0.0	12.9	+0.3	12.9
2,500-----	13.8	+1.0	12.2	+1.2	10.4	0.0	13.5	-0.1	10.4	+0.5	10.5
3,000-----	10.7	+1.1	10.3	+2.4	7.6	+0.1	11.2	+0.4	7.8	+0.8	7.7
3,500-----	7.7	+1.0	7.0	+2.3	4.6	0.0	8.2	+0.4	4.8	+0.7	4.5
4,000-----	5.1	+1.5	3.8	+2.0	1.7	-0.2	6.2	+1.5	1.9	+0.6	1.5
4,500-----	3.5	+2.3	0.8	+1.8	-1.7	-1.1	-----	-----	-1.1	+0.3	-1.3
5,000-----	-----	-----	-----	-----	-4.3	-1.0	-----	-----	-----	-----	-----

RELATIVE HUMIDITY (%)

Surface.....	69	0	60	-4	62	-6	77	+4	60	-2	78
250.....	69	0	60	-4	62	-6	77	+3	60	-2	80
500.....	65	-1	62	-4	62	-5	77	+2	61	-3	74
750.....	64	-1	65	-3	61	-2	75	+4	61	-5	73
1,000.....	64	-1	68	-2	62	+1	76	+10	65	-3	67
1,250.....	61	-4	68	-3	59	0	75	+12	66	-2	67
1,500.....	55	-9	72	+1	59	+2	70	+8	63	-4	67
2,000.....	48	-14	72	+1	61	+6	65	+5	61	-2	68
2,500.....	47	-14	63	-7	56	+3	64	+5	55	-1	67
3,000.....	48	-13	58	-10	54	+4	59	+1	47	-6	68
3,500.....	50	-11	61	-4	56	+6	59	0	49	-1	67
4,000.....	53	-8	63	0	60	+9	83	+20	50	+3	61
4,500.....	50	-5	65	+8	63	+11	83	-----	52	+5	43
5,000.....	-----	-----	-----	-----	47	+1	-----	-----	-----	-----	-----

TABLE 1.—Free-air temperatures, relative humidities, and vapor pressures during July, 1926—Continued

VAPOR PRESSURE (mb.)											
Altitude, m. s. l. (meters)	Broken Arrow, Okla. (233 meters)		Due West, S. C. (217 meters)		Ellendale, N. Dak. (444 meters)		Groesbeck, Tex. (141 meters)		Royal Center, Ind. (225 meters)		* Wash- ington, D. C. (7 meters)
	Mean	De- par- ture from 8-year mean	Mean	De- par- ture from 6-year mean	Mean	De- par- ture from 9-year mean	Mean	De- par- ture from 8-year mean	Mean	De- par- ture from 9-year mean	Mean
Surface.....	22.04	-1.76	21.58	-0.93	16.04	-1.07	26.28	+0.80	18.10	-1.46	22.39
250.....	21.82	-1.78	21.30	-0.83	15.52	-1.01	25.14	+0.59	17.88	-1.40	20.56
500.....	19.21	-1.49	19.25	-0.55	15.52	-0.51	22.75	-0.54	16.22	-0.88	17.72
750.....	17.42	-1.48	17.86	-0.44	13.81	-0.51	20.48	+1.04	15.14	-0.49	16.08
1,000.....	15.94	-1.01	16.73	-0.23	12.82	+0.02	19.05	+2.11	14.29	-0.11	13.85
1,250.....	14.04	-1.40	15.31	-0.29	11.27	-0.16	17.27	+2.26	13.25	+0.20	12.69
1,500.....	12.00	-1.91	14.47	+0.36	10.26	+0.06	14.72	+1.18	11.81	+0.16	11.67
2,000.....	9.12	-2.03	11.56	+0.06	8.85	+0.57	11.82	-0.61	9.24	+0.34	9.91
2,500.....	7.44	-1.52	8.42	-0.74	7.18	+0.44	9.75	-0.48	6.73	+0.23	8.25
3,000.....	6.40	-0.84	6.97	-0.31	6.11	+0.68	7.87	-0.09	4.88	-0.13	6.82
3,500.....	5.56	-0.37	6.08	+0.49	5.43	+0.88	6.53	-0.05	4.24	+0.16	5.42
4,000.....	5.05	+0.29	5.54	+1.05	4.96	+1.14	8.32	+2.43	4.08	+0.82	4.04
4,500.....	4.30	+0.67	4.98	+1.43	3.68	+0.61	-----	-----	4.04	+1.15	2.67
5,000.....	-----	-----	-----	-----	2.27	-0.42	-----	-----	-----	-----	-----

* Naval Air Station.

TABLE 2.—Free-air resultant winds (m. p. s.) during July, 1926

Altitude m. s. l. (meters)	Broken Arrow, Okla. (233 meters)				Due West, S. C. (217 meters)				Ellendale, N. Dak. (444 meters)				Groesbeck, Tex. (141 meters)				Royal Center, Ind. (225 meters)				Washington, D. C. (34 meters)			
	Mean		8-year mean		Mean		6-year mean		Mean		9-year mean		Mean		8-year mean		Mean		9-year mean		Mean			
	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.		
Surface.....	S. 16°W.	2.5	S. 3.0S.	31°E.	0.7S.	61°W.	1.0N.	42°E.	1.8N.	26°E.	0.2S.	3°E.	3.8S.	19°W.	3.6S.	43°E.	0.6S.	78°W.	1.4N.	26°W.	0.4	0.4		
250.....	S. 15°W.	2.6	S. 3.1S.	24°E.	0.7S.	63°W.	1.1N.	42°E.	1.8N.	26°E.	0.1S.	5°E.	4.5S.	21°W.	4.5S.	22°E.	1.0S.	75°W.	1.6N.	24°W.	1.0	1.0		
500.....	S. 11°W.	4.8S.	4.6S.	12°W.	4.6S.	65°E.	0.9S.	74°W.	1.5N.	54°E.	1.8S.	76°E.	1.6S.	45°W.	6.0S.	22°W.	2.4S.	70°W.	3.0N.	42°W.	2.7	2.7		
750.....	S. 20°W.	5.0S.	5.0S.	20°W.	5.0S.	62°E.	1.1S.	83°W.	1.7N.	55°E.	1.9S.	14°W.	0.8S.	9°W.	6.3S.	28°W.	2.6S.	72°W.	3.9N.	43°W.	4.1	4.1		
1,000.....	S. 21°W.	4.6S.	4.6S.	28°W.	4.9S.	76°E.	1.2W.	-----	2.0N.	62°E.	1.6S.	45°W.	1.3S.	15°W.	6.1S.	30°W.	5.9S.	78°W.	3.0S.	80°W.	4.5	4.5		
1,250.....	S. 28°W.	3.9S.	3.9S.	32°W.	4.6N.	57°E.	1.2S.	88°W.	2.3N.	52°E.	1.5S.	62°W.	1.7S.	13°W.	5.9S.	30°W.	5.5S.	87°W.	4.5S.	83°W.	6.4	6.4		
1,500.....	S. 36°W.	3.7S.	3.7S.	38°W.	4.5N.	73°E.	0.8S.	38°W.	3.2N.	67°E.	1.0S.	73°W.	2.4S.	17°W.	5.3S.	29°W.	4.9N.	83°W.	6.0S.	87°W.	6.1N.	62°W.	4.5	
2,000.....	S. 41°W.	4.1S.	4.1S.	41°W.	3.7N.	42°W.	3.8N.	85°W.	5.0N.	9°W.	0.9S.	88°W.	3.7S.	18°W.	5.5S.	30°W.	4.0N.	86°W.	7.8S.	89°W.	7.3N.	72°W.	4.9	
2,500.....	S. 63°W.	4.4S.	4.4S.	54°W.	3.9N.	53°W.	5.6N.	82°W.	6.1N.	71°W.	1.8N.	83°W.	5.6S.	22°W.	6.6S.	25°W.	3.9S.	88°W.	11.3N.	88°W.	9.8N.	66°W.	6.6	
3,000.....	S. 66°W.	4.6S.	4.6S.	63°W.	4.4N.	49°W.	7.6N.	88°W.	7.6N.	74°W.	6.2N.	82°W.	7.4S.	27°W.	5.0S.	23°W.	3.8N.	88°W.	12.9W.	-----	11.4N.	76°W.	5.6	
3,500.....	N. 76°W.	4.7S.	4.7S.	82°W.	4.8N.	67°W.	9.6N.	81°W.	7.8N.	72°W.	14.1N.	74°W.	10.3S.	24°W.	4.0S.	16°W.	2.5S.	87°W.	12.6S.	87°W.	11.2N.	87°W.	7.2	
4,000.....	N. 66°W.	4.5S.	4.5S.	79°W.	6.1N.	78°W.	10.4N.	81°W.	8.7N.	72°W.	15.9N.	69°W.	11.8S.	68°W.	11.1S.	86°W.	1.6N.	58°W.	15.3N.	68°W.	10.4S.	79°W.	8.1	
4,500.....	N. 53°W.	10.4S.	10.4S.	83°W.	8.1N.	78°W.	10.8N.	84°W.	9.6S.	78°W.	17.0N.	70°W.	13.3S.	68°W.	11.1N.	12°W.	2.4N.	45°W.	14.0N.	46°W.	9.5S.	83°W.	9.0	
5,000.....										67°W.	26.2N.	79°W.	15.9											

THE WEATHER ELEMENTS

By P. C. DAY, in Charge of Division

PRESSURE AND WINDS

As is usual in summer there was little important atmospheric activity save from about the 7th to 10th when a cyclone moved from western Canada through the Dakotas, upper Mississippi Valley, Great Lakes region, and to the St. Lawrence Valley. This was attended by heavy local rains, severe thunderstorms, hail and high winds over large areas from the middle and northern plains eastward. Pressure during this storm was unusually low for the summer season over large areas in the upper

Mississippi Valley and Great Lakes region, some stations reporting the lowest sea-level pressures ever observed in July.

From the 14th to 16th low pressure was general over the Gulf and Atlantic Coast States, but without definite cyclonic features until the latter part of the period, though heavy rains fell over much of the territory.

There was little cyclonic activity during the latter half of the month until toward the end, when a severe tropical storm moved northwestward over the Bahama Islands to the Florida Peninsula, reaching the northeast coast of that State on the morning of the 28th attended by hurricane winds and heavy rains, whence it moved with decreasing intensity over the central portions of